What is claimed is:

- **The Method of Multiple Concurrent Simultaneous Tasks Support Within a Single or Multiple Web-Consoles Window of CCDSVM**

1: A method for supporting multiple simultaneous concurrent tasks within a single web-console in CCDSVM environment (Fig. 2) comprises the steps of:

(a) User login from web-console of console host into CCDSVM environment.

(b) User from web-console of console host obtains all information of the target systems within CCDSVM environment.

(c) User from web-console of console host selects target system and initiate tasks based on information of CCDSVM environment.

(d) Console supporting software on control management station gets and stores tasks into a user space task list, and also obtains the associated locks for each tasks.

(e) Console supporting software arranges tasks to be run on the target systems until the tasks got finished.

- **User login to CCDSVM environment**

2: The method of claim 1, wherein, step (a) further includes:

- The web-console of console host gets login web-page from console supporting software of control management station.
- The user provides account name and password information to login-page on web-console of console host.
- The web-console of console host sends the authentication information to console supporting software of control management station.

3: The method of claim 1, wherein, step (a) further include

- The console supporting software of control management station performs the authentication validation checking to determine if this user is allowed to login.

4: The method of claim 1, wherein, step (a) further include

- The multiple users could login from web-consoles of multiple different console hosts concurrently.

- Get necessary CCDSVM information for task initiation

5: The method of claim 1, wherein, step (b) further includes:

- The console supporting software of control management station gets necessary information from service software modules of all system units via communication link between them.
- The console supporting software of control management station sends information of all system units, control management station and others to the web-console of console host.

6: The method of claim 1, wherein, step (b) further includes:

- The information obtained by each user could be the IP address of each units within CCDSVM, could be a devices on a system such disk or network card or could be a file and all others, which are necessary to allow any users to initiate tasks in CCDSVM environment.

- Initiate Tasks

7: The method of claim 1, wherein, step (c) and claim 5 further includes:

- Based on information obtained from console support software of control management station, multiple simultaneous concurrent tasks for a target system or for several different target systems could be initiated from a single web-console of a console host.
- The target system could be any of system units or control management station.

- The task information is send from web-console of console host to console support software modules of control management station.

8: The method of claim 1, wherein, step (c) and claim 5 further includes:

- Based on information obtained from console support software of control management station, multiple users on multiple console hosts, each of them from a single web-console of multiple console hosts, can initiate multiple simultaneous concurrent tasks for a target system or for several target systems.
- The target system could be any of system units or control management station.
- The task information is send from web-console of console host to console support software modules of control management station.

- **User space task list and the associated locks used for multiple simultaneous concurrent tasks support in CCDSVM:**

9: The method of claim 1, wherein, step (d) further includes:

- The console supporting software of control management station gets task information from web-console of console hosts.
- The console supporting software of control management station stores information of each tasks one at time into a valid slot in its user space task list.
- The console supporting software of control management station acquires associated locks to protect the resources used by each tasks and further to prevent each tasks from interfering each other or from blocking each other.

10: The method of claim 1, wherein, step (d) further includes:

- The locks acquired for each tasks could be conventional or non-conventional lock. The conventional lock can be acquired and released by same thread. The non-conventional lock can be acquired by one thread or process and be released by another thread or process.

- **Run Tasks in CCDSVM environment:**

11: The method of claim 1, wherein, step (e) further includes:

Based on task information, the console support software of control management station determines which target system the task to be executed on.

12: The method of claim 1, wherein, step (e) further includes:

If the target of a task is for a system unit, the console support software of control management system transmits the task information to the service software module of the target system units.. Otherwise, the task will carried out on control management station.

13: The method of claim 1, wherein, step (e) further includes:

The console support software of control management station or the service software module of system unit needs to determine if an additional thread needs to be created to carry out the tasks. If there is needs, an additional thread is created to carry out the task. Otherwise, the threads of the console support software modules of control management station, or the threads of service software modules of system unit carries out the task.

14: The method of claim 1, wherein, step (e) further includes:

- The console supporting software needs to determine if a task is permitted to run by a specific user, who initiated this task.
- The console supporting software also needs to determine if a task is permitted to run on a specific target system by a user, who initiated this task.

15: The method of claim 1, wherein, step (d) and step (e) also includes each tasks' associated locks will be released one at a time along with each tasks' executing up to the point that task is done. Therefore, each tasks can be executed properly without any time delay.

- **The CCDSVM**

16: The CCDSVM stands for central controlled distributed scalable virtual machine system. It consists

a) central control management station
b) system units
c) console hosts
d) network infrastructure (net1 and net2)

17: The claim16 further includes

If the system units do not present, the CCDSVM degenerated into a simple server and all claims, wherein, described in this document can be applied to this simple server except to those claims related to system unit.

18: The claim 16 further includes

Complemented by multi-tasking support on web-console, the CCDSVM can have the following full features:

a) Support multiple simultaneous concurrent system tasks and operations from a single web-console on a console host or from multiple consoles on multiple console hosts anywhere on the net.
b) Configuration of the entire resources in CCDSVM environment such as storage, network, and others.
c) Deliver scalable distributed application services or contents to each end users on client systems anywhere on the net such as video service, storage services, security service, database service, and all other web services.

19: The claim 18 further includes

a) The all features claimed in 18 allow the entire CCDSVM to be operated just like a giant single machine.
b) The combination of console support software, web server software, and other service software modules on control management station,

the service software modules on all system units and the web browser software on console host have formed a web-base computer user work environment for CCDSVM virtual machine.

- **The Console hosts**

20: The claim 16, item (c) further includes

a) The console host could be any system and anywhere on the net. It could be a server, a desktop or laptop PC, a hand held personal computer or devices such as PDA, or a cell phone running with operating system such as Linux, MS Window, Unix or others. In addition, a web browser must be available to be used as a web-console.

b) To support web-console, the console host must have web browser software, which could be an existing commercial or proprietary software, which is able to handle web protocol such as HTTP. Therefore, it could be used to access information provided by console supporting software on control management station and initiate tasks over entire CCDSVM. The web-console could be implemented with any suitable programming languages.

c) If there is needs to support a less effective non-web-based network console, a new networked software module is required, which may use a protocol other than web protocol (HTTP) and it can communicate with control management station's console support software.

d) The console host may also includes other software modules, which may be implemented with any suitable programming languages such as C, C++, Java, XML etc.. The other software module may also communicate with control management station using IP, non-IP or any suitable protocols to get or send data between console host and server control management station.

- Network Infrastructure

21: the claim16, wherein, item (d) further includes

a) The network infrastructure represents any kind of communication link between control management station, console host, system units and client hosts. The link could be an infrastructure of internet, intranet, LAN/WAN, or others and could be connected by using media such as cable (Ethernet, Fibre, SCSI, and other), wireless media, or bus. It also may include network equipment such switch/routers/adapter etc.

b) The network infrastructure connects control management station, console host, system units together to form a CCDSVM as well as connecting client system to let them access CCDSVM.

c) The network infrastructure may also include Internet software structure such as domain name server, which helps each system on net to find the network address such as IP address.

- System Units:

22: The claim 16, wherein, item (b) further includes

a) The system units may be a server system, a desktop or laptop PC, any operational system, a device or component. For example, it could be a video server, web server, database server other servers, storage block data server (SAN unit), network attached storage (NAS), a security monitor device, a communication device PDA or cell phone, and other devices such as a Raid/Disk etc..

b) Each system units may run with operating system such Linux, MS Window, various Unix, or others.

c) The system unit must contain service software modules, which is capable to communicate with control management station to carry out tasks, or to communicate with client systems to deliver services to them, or to communicate with another system unit for data transferring.

d) The service software modules may be implemented with any suitable languages such as C, C++, Java, XML etc..

e) The communication protocols used by service software on system units could be any suitable IP based or non-IP based protocols.

- Control Management Station:

23: The claim 16, wherein, item (a) further includes

a) The control management station could be a server or a other type of computer system, or a communication system, or a device, which is able to control, manage large number of system units and support the delivery of the distributed services or contents. It may run with operating system such as Linux, various Unix, MS Window or others.

b) The control management station must have web server software and console supporting software. It may also have a native web-browser used as native web-console. The console supporting software may includes web server interface software modules, control management software modules, and it may include others service software modules.

c) The console support software modules may be implemented with any suitable programming languages such as C, C++, Java, XML, etc..

24: The claim 23, wherein, item (b) further includes

a) The console supporting software communicates with web server software through inter-process communication mechanism. It also communicates with service software module of system units by using any suitable protocols such as IP based or non-IP based or other protocols via communication link of network infrastructure.

b) The web server and web-browser software could be an existing commercial software from a major vendor or other proprietary software, which is able to accept and handle the web protocol such as HTTP. The web server software of control management station sends data to and receives data from the web-console of console hosts or from web-console of the native system.

c) If there is needs to support a less effective non-web-based network console, there is no need for web server software and web server interface software on control management station. Instead, there is need for network software module, which is able to communicate network console on console host via network link using protocol other than web protocol (HTTP). In addition, it can be implemented with any suitable programming languages. Also, it is able to communicate with control management software module via inter-process communication mechanism on control management station.

- Threads

25: The claim 24, wherein, item (a) further includes

a) There may be several fixed threads being created based on control management software modules. There are may be various number of threads are created based on web server interface software modules for each tasks being initiated by user at web-console.

b) These threads may be communicated with each other through inter-process communication mechanism.

26: The claim 24, wherein, item (a) further includes

- The console supporting software includes the user space task list.

- Max Tasks

27: The claim 18, wherein, item (a) further includes

- The total number of concurrent tasks can not exceed the maximum tasks, which is setup by the console supporting software based on the capacity of control management station and the practical use of the web-console.

User Credential Checking:

28: The claim 1, wherein step (a) together with the claim 14 further evidenced

a) A said two level security authentication scheme used in CCDSVM environment.
b) The first level of security authentication is imposed on control management station.
c) The second level of security authentication is imposed on system units.

29: The claim 28 further includes
a) The first level of security authentication includes the login authentication such as user and password checking and the authentication of specific users to perform specific tasks on the control management station. For example to allow a user to own certain size of storage volumes on a target system and allow user to exercise all storage operations on their own storage volumes etc.
b) The second level of authentication includes the authentication of specific user to access specific number of system units, and to perform specific tasks on permitted system units in CCDSVM environment.
c) The second level of authentication also includes the authentication of specific services of the specific system unit, which could be provided to specific clients.

The Type of Tasks Supported in Web-Console of CCDSVM Environment:

30: The claim 18, wherein, item a) further includes that the multiple simultaneous concurrent tasks issued from a web-console by a user could be any of the followings:
a) Move or transmit data such as a multiple Gig-bytes data file or other data in any form from any point or any system to another point or system within CCDSVM.
b) Configure, partition, and assign entire storage system (raid/disk) within CCDSVM.
c) Setup authentication of specific user from a specific web-console with certain privilege for entire CCDSVM or for one or several systems, which

could be any system unit or control management station. Setup authentication for services of CCDSVM to provide to clients.

d) Monitor and display network, storage, CPU, processes and threads activities and status for entire CCDSVM.

e) Create and mount file system, file and directory structures, and performing all related data file operations on either control management system or system units.

f) And all other kind of system tasks such as read permitted documentation files etc.

31: The claim 30, further evidence

- From web-console of CCDSVM, users are able to perform full range of multiple concurrent system tasks and operations for entire CCDSVM environment. These system tasks and operations are compatible to those concurrent system tasks and operations can be performed on a native system in other operating system environment such as Microsoft Window system environment, Apple Computer's window environment, or Linux and various Unix console environment.
- The capability of providing users the multiple concurrent simultaneous operations and tasks on web console has indicated that the supporting of web-console has created a web-based computer user working environment for the various operating systems of either for a single system or for a group of systems. Further, it allows an user to access exact same working environment through web-console either on native system or from other remote system. Therefore, this is a consistent user work environment for various operating systems on different hardware systems.

32: The claim 30, wherein, item a) further includes

- The service software modules on system units together with the control management software modules on control management station can

actually perform all of these system operations in responding to the multiple concurrent tasks and operations initiated from web-console.

Support Multi-Tasks With Non-Web-Based Console in CCDSVM Environment

33: The claim 20, wherein, item (c) together with claim 24, wherein, item (d) further evidence

- All methods and principles described from claim1 to claim 29 are applicable to support multiple simultaneous concurrent tasks with less effective non-web-based console in CCDSVM environment.

The Others

34: the claim 16, claim 22 and claim 23 together further includes

- To more efficiently support multiple concurrent tasks over a larger number of system units, all systems in CCDSVM may be organized into multiple layers with multiple groups. Within a layered CCDSVM structure the middle layer of control management stations also becomes the system units of the control management station at the layer above it.
- The control management station at middle layer must have software modules of both control management station and system unit.

35: The claim 16 further includes

- The CCDSVM structure provides a powerful scalability mechanism to efficiently support thousands of heterogeneous system units just like a single machine in Intranet, Internet and LAN environment.

36: The claim 20 with item a), b), and d) together with claim 30) further includes

a) When the wireless devices used as web-console host, the users on web-console of these wireless devices can partition storage, create and mount file system, and create file/directory hierarchy for any systems within

CCDSVM. In addition, user can move any type of data to the storage on these systems from console host itself or from any other system within CCDSVM. This actually is in the sense that it has enabled the users of these wireless devices to actually own a huge amount of virtual external storage such as owning multiple Gig Bytes disk storage on either system units or control management station.